

Remarks

I. Status of claims

Claims 1-9 and 11-29 were pending.

Claim 26 has been canceled without prejudice.

Claim 30 has been added.

II. Claim rejections under 35 U.S.C. § 112

A. Rejections under 35 U.S.C. § 112, first paragraph - written description

1. Claims 1 and 26-29

The Examiner has rejected claims 1 and 26-29 under 35 U.S.C. § 112, first paragraph, because “Nowhere in the specification it states that the network management module proactively launches migratory recovery modules into the network” (original emphasis).

Independent claim 1 has been amended and now recites:

1. A system for managing a plurality of distributed nodes of a network, comprising:

a network management module that launches migratory recovery modules into the network to monitor status of each of the network nodes;

wherein each of the recovery modules is configured to migrate from one network node to another, determine a respective status of each of the network nodes to which it has migrated, and initiate a recovery process on ones of the network nodes having one or more failed node processes, the recovery modules determine the status of each of the network nodes, and the network management module monitors transmissions that are received from the recovery modules to provide periodic monitoring of the status of each of the network nodes.

The disclosure supports the changes to claim 1 as follows:

1. “The recovery modules 20 migrate from node to node, determine the status of each node...” (page 5, lines 13-14; see also page 3, lines 2-3);
2. “If recovery module 20 determines that one or more node processes have failed (step 82), recovery module 20 may initiate a recovery process in accordance with a conventional restart protocol (step 84)” (page 10, lines 3-5; see also page 10, lines 5-7);
3. “The network management module monitors transmissions that are received from the recovery modules 20 that were launched into distributed computing system 10 (step 52)” (page 8, lines 26-28);
4. “By periodically monitoring each of the network nodes - as opposed to continuously monitoring each node - the invention easily may be scaled to large networks” (page 3, lines 6-8).

Thus, claim 1 no longer recites the word “proactively”. Moreover, the subject matter of claim 1 is described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor had possession of the claimed invention at the time the application was filed. Therefore, the Examiner’s rejection of independent claim 1 under 35 U.S.C. § 112, first paragraph, for failing to comply with the written description requirement now should be withdrawn.

The word “proactively” also has been deleted from each of claims 26-29. Accordingly, the Examiner’s rejection of claims 26-29 under 35 U.S.C. § 112, first paragraph, for failing to comply with the written description requirement also should be withdrawn.

2. Claims 11 and 20

The Examiner has rejected claims 11 and 20 under 35 U.S.C. § 112, first paragraph, because “Nowhere in the specification it states ‘(c) after initiating the recovery process, migrating from the current network node to a successive one’” (original emphasis).

In accordance with MPEP § 2163.II.A.3(b):

The examiner has the initial burden of presenting evidence or reasoning to explain why persons skilled in the art would not

recognize in the original disclosure a description of the invention defined by the claims.

In this regard, the Examiner merely has pointed out that the word “after” is not explicitly recited in the specification. It is well-settled, however, that the specification need not contain a literal transcription of the claim language defining the invention in order to satisfy the written description requirement. Instead, the application need only reasonably convey the claimed subject matter to a person of ordinary skill in the art. In accordance with MPEP § 2163.II.A.3(b):

When an explicit limitation in a claim “is not present in the written description whose benefit is sought it must be shown that a person of ordinary skill would have understood, at the time the patent application was filed, that the description requires that limitation.” Hyatt v. Boone, 146 F.3d 1348, 1353, 47 USPQ2d 1128, 1131 (Fed. Cir. 1998).

Contrary to the Examiner’s statement, the subject matter of claims 11 and 20 is described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor had possession of the claimed invention at the time the application was filed. In particular, the specification describes the subject matter of claims 11 and 20 as follows (emphasis added):

1. “The recovery modules 20 migrate from node to node, determine the status of each node, and initiate recovery processes on failed nodes (page 5, lines 13-15, emphasis added; see also page 3, lines 2-4);
2. “As shown in FIG. 5, in one embodiment, during execution on a network node, a migratory recovery module 20 may monitor the status and initiate recovery processes (if necessary), as follows. Initially, recovery module 20 monitors the health of the network node (step 80). Recovery module 20 may probe the health of an associated node process by accessing one or more node monitoring resources of the network node in accordance with a conventional heartbeat messaging protocol. Recovery module 20 may detect if the node process has failed, monitor the node log file for any indication of process failure, exchange heartbeat messages with the node process, or make calls to the node system manager to determine if the system is operating properly. If recovery module 20 determines that one

or more node processes have failed (step 82), recovery module 20 may initiate a recovery process in accordance with a conventional restart protocol (step 84). For example, recovery module 20 may attempt to restart the failed process by transmitting a request to a process execution service operating on the failed network node. The status of the node, including information relating to any failed node processes (e.g., any logged checkpointing information or other information dumps), is reported to the network management module (step 86). The node status report may be transmitted in accordance with SNMP. Recovery module 20 then may request to be transmitted to the next destination network node (step 88). Recovery module 20 may make the transmission request by invoking a recovery module migration method. The migration method may call a corresponding migration method of recovery module operating environment that halts operation of the recovery module 20 and transmits the recovery module code and data to a specified destination node. Recovery module 20 may include a routing method that may be invoked to identify the destination node address based upon a routing table stored at the network node. The destination node may be selected randomly or in accordance with a prescribed routing policy.” (Page 9, line 25 - page 10, line 20, emphasis added; FIG. 5)

Thus, one skilled in the art at the time the invention was made would understand from the explicit teachings of the specification that: (a) on a current one of the network nodes, a recovery module determines a status of the current network node (see page 9, line 27 - page 10, line 3); (b) in response to a determination that the current network node has one or more failed node processes, the recovery module initiates a recovery process on the current network node (see page 10, lines 3-7); (c) after initiating the recover process, the recovery module migrates from the current network node to a successive one of the network nodes (see page 10, lines 11-16 (emphasis added): “Recovery module 20 then may request to be transmitted to the next destination network node (step 88). Recovery module 20 may make the transmission request by invoking a recovery module migration method. The migration method may call a corresponding migration method of recovery module operating

environment that halts operation of the recovery module 20 and transmits the recovery module code and data to a specified destination node.”)

In interpreting claims, the general rule is that terms in the claims are to be given their ordinary and accustomed meaning. In the context of the process shown in FIG. 5 and described on page 9, line 25 - page 10, line 20, one skilled in the art at the time the application was filed would give the word “after” an ordinary and accustomed meaning that is equivalent to the meaning of the word “then” on page 10, line 11 (see, e.g., Merriam-Webster’s Collegiate Dictionary, 10th Ed., definition 2a of the adverb “then”: “soon after that : next in order of time”).

Thus, the subject matter of claims 11 and 20 is described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor had possession of the claimed invention at the time the application was filed. Therefore, the Examiner’s rejection of independent claims 11 and 20 under 35 U.S.C. § 112, first paragraph, for failing to comply with the written description requirement should be withdrawn for at least the reasons explained above.

B. Rejections under 35 U.S.C. § 112, first paragraph - enablement

The Examiner has rejected claim 1 under 35 U.S.C. § 112, first paragraph, because “The specification does not provide a clear description that if a network node is failed how can a migratory module get to that node to initiate the recovery process of that node” (emphasis added).

Claim 1 has been amended to clarify that each of the recovery modules is configured to “initiate a recovery process on ones of the network nodes having one or more failed node processes.” The specification describes this subject matter on, for example, page 10, lines 3-7. In light of this amendment, the Examiner’s rejection of independent claim 1 under 35 U.S.C. § 112, first paragraph, for failing to comply with the enablement requirement should be withdrawn.

III. Claim rejection under 35 U.S.C. § 102

The Examiner has rejected claim 5 under 35 U.S.C § 102(e) over Turek (U.S. 6,460,070).

Independent claim 5 recites:

5. A system for managing a plurality of distributed nodes of a network, comprising:

a recovery module configured to migrate from one network node to another, determine a status of a network node, and initiate a recovery process on a network node having one or more failed node processes, wherein the recovery module is configured to determine the status of a network node in accordance with a heartbeat messaging protocol.

In support of the rejection of claim 5, the Examiner has stated that (emphasis added):

As per claim 5 Turek disclosed a system for managing a plurality of distributed nodes of a network, comprising: a recovery modules configured to migrate from one network node to another, determine a status of a network, and initiate a recovery process on a failed network node (col.2, lines 65-67 & col.2, lines 1-46) wherein the recovery module is configured to determine the status of a network node in accordance with a heartbeat messaging protocol (col.2, lines 22-46). Although Turek did not specifically mentioned a heartbeat messaging protocol to determine the status of a network node. However Turek did disclose collecting information about network conditions to include network node by the use of mobile software agents that that periodically check the network status information, which is an inherent function of a heartbeat messaging protocol.

It is well settled that:

To serve as an anticipation when the reference is silent about the asserted inherent characteristic, such gap in the reference may be filled with recourse to extrinsic evidence. Such evidence must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill.

Continental Can Company USA, Inc. v. Monsanto Co., 948 F.2d 1264, 20 USPQ2d 1746 (Fed. Cir. 1991). In the present case, there is no basis for the Examiner to assume that one skilled in the art would have recognized that the software agents deployed by the dispatch

mechanism in accordance with Turek's teachings necessarily determines the status of a network node in accordance with a heartbeat messaging protocol.

Turek explicitly teaches that when a particular software agent is received at a given node, the software agent "determines whether the event originated from the node" and, if so, "identifies the cause and, if possible, undertakes a corrective or other action depending on the nature of the event in question" (col. 2, lines 49-53). In other words, "Generally, the mobile software agents traverse the network to diagnose and, if possible, to correct a network fault" (col. 5, lines 40-42). There is no part of Turek's disclosure that teaches that the software agents use a heartbeat messaging protocol to determine the status of a network node. Indeed, Turek's software agents are deployed only after an event, such as a network fault, has occurred (see, e.g., col. 2, lines 35-37). Therefore, there is no need for the software agents to use a heartbeat messaging protocol to detect node failures. Instead, each software agent need only be tailored to specifically identify the particular network fault that triggered the deployment of the software agent by the dispatch mechanism 15 (see, e.g., col. 5, lines 31-60 and col. 6, lines 23-59).

Heartbeat messaging is a well-known feature of clustered networks in accordance with which a "heartbeat" message is sent regularly from one node to another node merely to detect failed applications or failed nodes (see, e.g., Forbes, U.S. 6,728,896, col. 4, lines 27-33, and col. 9, lines 2-14; cited by the Examiner). Such heartbeat messages indicate the state "I'm here, are you here?" (see, e.g., Forbes, col. 9, lines 2-14). There is not basis for the Examiner's assumption that the software agent that is selected and deployed specifically in response to a particular, previously identified fault event would have used a heartbeat messaging protocol to determine whether that fault event originated from a given node or to identify the cause of that fault event. To the contrary, one skilled in the art at the time the invention was made would have understood that heartbeat messages merely detect failed applications and failed nodes and do not provide sufficient information to determine whether a particular fault event originated from a given node or to identify the cause of that fault event.

For at least these reasons, the Examiner's rejection of independent claim 5 under 35 U.S.C. § 102(e) over Turek should be withdrawn.

IV. Claim rejections under 35 U.S.C. § 103

The Examiner has rejected claims 1-9, and 11-25 under 35 U.S.C § 102(e) over Turek (U.S. 6,460,070).

A. Independent claim 1

Independent claim 1 has been amended and now recites:

1. A system for managing a plurality of distributed nodes of a network, comprising:
 - a network management module that launches migratory recovery modules into the network to monitor status of each of the network nodes;
 - wherein each of the recovery modules is configured to migrate from one network node to another, determine a respective status of each of the network nodes to which it has migrated, and initiate a recovery process on ones of the network nodes having one or more failed node processes, the recovery modules determine the status of each of the network nodes, and the network management module monitors transmissions that are received from the recovery modules to provide periodic monitoring of the status of each of the network nodes.

Turek's system does not launch migratory recovery modules into a network to monitor status of each of the network nodes, wherein the recovery modules determine the status of each of the network nodes and the network management module monitors transmissions that are received from the recovery modules to provide periodic monitoring of each of the network nodes.

In accordance with Turek's disclosure, the mobile software agents are deployed by the dispatch mechanism 15 only in response to either a report of a "network 'fault', alarm or other such trigger" (col. 7, lines 3-4) or a "request for maintenance in some non-specified area of the network" (col. 7, line 7). The dispatch mechanism 15 deploys a selected one of the software agents to the particular location of a fault or a particular area of a network where the fault is likely to have occurred (see, e.g., col. 7, lines 1-57). If the initial given node location does not contain the specific fault for which the software agent was deployed, the software agent identifies "a subset of nodes (associated with the given node) that remain

candidates for locating the error" (col. 8, lines 31-32). Once the particular fault is located and diagnosed, the software agent attempts to fix the problem (see col. 9, lines 21-22). "If unable to effect repairs, the agent will, at a minimum, report back with the diagnosis to a user interface of the dispatch mechanism" (col. 9, lines 28-30). Turek does not teach or suggest anything that would have led one skilled in the art at the time the invention was made to believe that the software agent migrates to any other nodes after attempting to "effect repairs" and reporting back with the diagnosis. Indeed, in accordance with Turek's teachings, each of the mobile software agents is deployed to diagnose and, if possible correct, only one particular network fault. Therefore, there is no need whatsoever for any of Turek's software agents to migrate from the node that contains the particular network fault that the software agent was deployed to diagnose and correct.

Thus, one skilled in the art at the time the invention was made would not have had any reasonable basis for believing that Turek's software agents determine the status of each of the nodes of a network. To the contrary, based on Turek's teaching, such a person reasonably would have recognized that the software agents are designed to recursively narrow the search for the particular network nodes for which they were respectively deployed and, after arriving at the target network nodes, the software agents attempt to effect repairs and report back diagnoses. That is, one skilled in the art at the time the invention was made would have recognized that the software agents are not configured to determine the status of each of the network nodes and that the dispatch mechanism is not configured to provide periodic monitoring of the status of each of the network nodes, as now recited in claim 1.

For at least this reason, the Examiner's rejection of independent claim 1 under 35 U.S.C. § 102(e) over Turek now should be withdrawn.

B. Claims 2-4, 6-9, and 21-25

Each of claims 2-4, 6-9, and 21-25 incorporates the features of independent claim 1 and therefore is patentable over Turek for at least the same reasons explained above.

C. Independent claim 5

The Examiner did not provide any explanation in support of his rejection of claim 5 under 35 U.S.C. § 103(a).

Applicant maintains that independent claim 5 is patentable over Turek for at least the same reasons explained above in connection with the rejection of claim 5 under 35 U.S.C. § 102(e).

D. Independent claim 11

Independent claim 11 has been amended and now recites:

11. A method for managing a plurality of distributed nodes of a network, comprising:
 - (a) on a current one of the network nodes, determining a status of the current network node;
 - (b) in response to a determination that the current network has one or more failed node processes, initiating a recovery process on the current network node;
 - (c) after initiating the recovery process, migrating from the current network node to a successive one of the network nodes; and
 - (d) repeating (a), (b), and (c) with the current network node corresponding to the successive network node for each of the nodes in the network.

In the rejection of claim 11, the Examiner has stated that Turek discloses that a software agent migrates from a current node to a successive one of the network nodes after initiating a recovery process on the current node. None of the sections cited by the Examiner, however, supports this contention.

In accordance with Turk's teachings, the mobile software agents do not migrate from a current network node to a successive one of the network nodes after initiating a recovery process on the current network node. Instead, after initiating a recovery process, Turek's mobile software agents merely report the problem and the corrective action that was taken to the dispatch mechanism 15 (see col. 8, lines 6-9; FIG. 4). Turek does not teach or suggest anything that would have led one skilled in the art at the time the invention was made to believe that the software agent migrates to any other nodes after attempting to "effect repairs"

and reporting back with the diagnosis. Indeed, in accordance with Turek's teachings, each of the mobile software agents is deployed to diagnose and, if possible correct, only one particular network fault. Therefore, there is no need whatsoever for any of Turek's software agents to migrate from the node that contains the particular network fault that the software agent was deployed to diagnose and correct.

For at least these reasons, the Examiner's rejection of independent claim 11 under 35 U.S.C. § 103(a) over Turek now should be withdrawn.

E. Claims 12-19

Each of claims 12-19 incorporates the features of independent claim 11 and therefore is patentable over Turek for at least the same reasons explained above.

F. Independent claim 20

Claim 20 has been amended and now recites that the computer program comprises computer-readable instructions for causing a computer to perform operations comprising:

migrating the computer program from one network node to a series of successive network nodes;

determining a status of a current one of the network nodes to which the computer program has migrated;

in response to a determination that the current network has one or more failed node processes, initiating a recovery process on the current network node; and

after initiating the recovery process on the current network node, migrating from the current network node to a successive one of the network nodes.

Claim 20 is patentable over Turk for at least the same reasons explained above in connection with independent claim 11. Accordingly, the Examiner's rejection of independent claim 20 under 35 U.S.C. § 103(a) over Turk now should be withdrawn.

G. Claims 26-29

The Examiner has rejected claims 26-29 under 35 U.S.C. § 103(a) over Turek in view of Douik (U.S. 6,012,152). Claim 26 has been canceled without prejudice.

Each of claims 27-29 incorporates the features of independent claim 1. Douik does not make-up for the failure of Turek to teach or suggest the features of independent claim 1 discussed above. Therefore, claims 27-29 are patentable over Turek and Douik for at least the same reasons explained above in connection with independent claim 1.

Claims 27-29 also are patentable over Turek in view of Douik for at the following additional reasons.

1. Claim 27

In support of the rejection of claim 27, the Examiner has stated that (emphasis added):

... Turek did not explicitly disclose, wherein the network management module statistically identifies target ones of the network nodes to achieve a specified confidence level of network monitoring reliability, and proactively launches the recovery modules into the network by transmitting respective ones of the recovery modules to the identified target network nodes. In the same field of endeavor Douik disclosed wherein the network management module statistically identifies target ones of the network nodes to achieve a specified confidence level of network monitoring reliability, and proactively launches the recovery modules into the network by transmitting respective ones of the recovery modules to the identified target network nodes (col. 11, lines 64-67 & col. 12, lines 1-19).

The Examiner apparently has misread claim 27. Claim 27 does not recite that the network management module “identifies target ones of the network nodes to achieve a specified confidence level of network monitoring reliability, and proactively launches the recovery modules into the network by transmitting respective ones of the recovery modules to the identified target network nodes.” Instead, claim 27 recites that “the network management module determines a number of the recovery modules needed to achieve a specified network monitoring service level, and launches the determined number of recovery modules into the network to achieve the specified network monitoring service level.” Thus,

on its face, the Examiner's rejection of claim 27 does not establish a *prima facie* case of obviousness (see MPEP § 706.02(j)).

Moreover, Douik does not teach or suggest anything about migratory recovery modules, much less anything about determining a number of the recovery modules needed to achieve a specified network monitoring service level and launching the determined number of recovery modules into the network to achieve the specified network monitoring service level.

For at least these additional reasons, the Examiner's rejection of claim 27 under 35 U.S.C. § 103(a) over Turek in view of Douik should be withdrawn.

2. Claim 28

In support of the rejection of claim 28, the Examiner has stated that (emphasis added):

... Turek did not explicitly disclose, wherein the network management module statistically identifies target ones of the network nodes to achieve a specified confidence level of network monitoring reliability, and proactively launches the recovery modules into the network by transmitting respective ones of the recovery modules to the identified target network nodes. In the same field of endeavor Douik disclosed wherein the network management module statistically identifies target ones of the network nodes to achieve a specified confidence level of network monitoring reliability, and proactively launches the recovery modules into the network by transmitting respective ones of the recovery modules to the identified target network nodes (col. 11, lines 64-67 & col. 12, lines 1-19).

In the disclosure cited by the Examiner (i.e., col. 11, line 64 - col. 12, line 19), Douik merely compares observed events to stored performance data and statistics in order to determine a suspected fault to explain the observed events and symptoms. Douik does not even hint that target nodes are identified statistically to achieve a specified confidence level of network monitoring reliability. Moreover, Douik does not teach or suggest anything about migratory recovery modules and launching the recovery modules into the network by transmitting respective ones of the recovery modules to the identified target network nodes.

For at least this additional reason, the Examiner's rejection of claim 28 under 35 U.S.C. § 103(a) over Turek in view of Douik should be withdrawn.

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Page : 21 of 21

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3. Claim 29

Claim 29 recites features that essentially track the pertinent features of claim 28 discussed above. Therefore, claim 29 is patentable over Turek and Doiuk for at least the same reasons explained above in connection with claim 28.

V. Conclusion

For the reasons explained above, all of the pending claims are now in condition for allowance and should be allowed.

Charge any excess fees or apply any credits to Deposit Account No. 08-2025.

Respectfully submitted,

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